R E P O R T R E S U M E S

ED 012 680 RE 000 185

PROGRAMMED INSTRUCTION AND AUTOMATION IN BEGINNING READING.

BY- FRY, EDWARD

PUB DATE MAY 67

EDRS PRICE MF-$0.25 HC-$1.16 29P.

DESCRIPTORS- *PROGRAMED INSTRUCTION, *READING RESEARCH, *BEGINNING READING, PROGRAMED TUTORING, PROGRAMED TEXTS, COMPUTER ASSISTED INSTRUCTION, INSTRUMENTATION, AUDIOVISUAL PROGRAMS, RESEARCH REVIEWS (PUBLICATIONS), SEATTLE, INTERNATIONAL READING ASSOCIATION

A REVIEW OF RECENT INVESTIGATIONS INTO THE EFFECTIVENESS OF PROGRAMED INSTRUCTION IN READING AND A CONSIDERATION OF TEACHER AND STUDENT ATTITUDES TOWARD THIS METHOD OF INSTRUCTION ARE PRESENTED. THE VARIOUS APPROACHES TO PROGRAMED INSTRUCTION DESCRIBED INCLUDE THE BUCHANAN PROGRAM READING SERIES, THE TALKING TYPEWRITER, TEACHING MACHINES (PHONICS OR WHOLE WORD APPROACH), PROGRAMED TUTORING (INCLUDING BOTH A TEACHER AND A MACHINE), COMPUTER-ASSISTED INSTRUCTION, TAPES WHICH TEACH READING SKILLS RANGING FROM READINESS TO THIRD GRADE, AND THE "AUD-X," A DEVICE WHICH DISPLAYS WORDS AS WELL AS READS THEM TO THE CHILD. EVIDENCE SHOWS THAT PROGRAMED INSTRUCTION, ALONG WITH COMPUTER-ASSISTED INSTRUCTION AND TALKING TYPEWRITERS, CAN TEACH BEGINNING READING, BUT THERE IS NO PROOF THAT THEY CAN TEACH READING ANY BETTER THAN REGULAR CLASSROOM TEACHING OR HUMAN TUTORING. IN THE ONLY WELL CONTROLLED STUDY, THAT MADE BY ROBERT RUDDELL AT THE UNIVERSITY OF CALIFORNIA, PROGRAMED LEARNING AND BASAL TEXTS CAME OUT EVEN. TABLES AND A BIBLIOGRAPHY ARE INCLUDED. THIS PAPER WAS PRESENTED AT THE INTERNATIONAL READING ASSOCIATION ANNUAL CONVENTION (12TH, SEATTLE, MAY 4-5, 1967). (RH)

ED012680

Edward Fry, Ph. D.
Director, Reading Center
Rutgers - The State University
10 Seminary Place
New Brunswick, New Jersey 08903

U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
OFFICE OF EDUCATION

RE 000 185

THIS DOCUMENT HAS BEEN REPRODUCED EXACTLY AS RECEIVED FROM THE PERSON OR ORGANIZATION ORIGINATING IT. POINTS OF VIEW OR OPINIONS STATED DO NOT NECESSARILY REPRESENT OFFICIAL OFFICE OF EDUCATION POSITION OR POLICY.

PROGRAMMED INSTRUCTION AND AUTOMATION IN BEGINNING READING*

Trying to find research in programmed instruction for beginning reading materials is most frustrating. The main problem is that there is very little reported research. Hence, my plan is to tell you what I have been able to dig up and then make a few general comments about programming and automation in reading.

*Speech given at the annual convention of the International Reading Association, Seattle, May 1967. It will appear in Volume 12 of the Proceedings.

Programmed instruction, since its very inception, has always been long on learning theory rationalizations and heartwarming discussions but relatively short on hard core data. A scholarly example of this is the current, 1967 NSSE Yearbook, which is entitled Programmed Instruction. (13)

Buchanan Programmed Reading

The biggest and best controlled study that was done was a study by Robert Ruddell at the University of California, Berkeley. (24) It was one of the U.S.O.E. sponsored first grade studies. In this study Ruddell used the Buchanan Program Reading series in six classrooms and the Sheldon basic readers in six other classrooms. The study also contained two other groups of classrooms that were getting special supplementary linguistic materials, but we will not concern ourselves with those.

The Stanford Achievement Test was given to all children. Ruddell reports raw scores for four of the five subtests related to reading. They were Paragraph Meaning, Word Reading, Word Study Skills, and Spelling. Of the four, probably Paragraph Meaning is the most important as it represents the most nearly true-to-life reading situation wherein student reads a paragraph

silently and answers some questions about it. On this test, the 132 children who had the Buchanan Programmed Reading scored 1.6 and the 132 children who had the Sheldon basic readers scored 1.7. The difference between the two is not significant and as you can see, they are both about normal for children near the end of the first year. Incidentally, these scores are just about the same as the other first grade projects obtained in other parts of the country using other basal readers, ITA, DMS, and various phonic and linguistic methods.

In the Word Reading section of the Stanford, the programmed reading children scored 1.8 and the basal reading children scored 1.7. Ruddell found this difference to be significant. I must hasten to add that Ruddell reported only raw scores and I simply took his raw scores and followed the directions given in the teachers manual to convert to grade level scores. This is an excellent illustration of what Clark Trow was talking about when he pointed out the difference between educational significance and statistical significance. (31) Here we see a difference of one-tenth of a year which hardly any classroom teacher or experienced educator would consider significant in terms of the reading ability of two groups; yet, by tests of "statistical significance," it is

significant at the .05 level. Let me hasten to remind you that the statistical significance between means only tells us that two means that far apart could not have occurred by chance except for five times in a hundred. It tells us nothing about the size of the difference between the two means. Classroom teachers, of course, are concerned with the size of the difference between the means; they want to know -- does one method teach reading better than another method?

Another section of the Stanford is the Word Study Skills which is a mild mixture of some phonics word attack skills test. Both the Programmed Reading and the basal readers scored 1.7. In terms of Spelling, there was the same lack of difference; namely, both groups scored 1.7.

A subsample of the same population consisting of about 44 students was given some individual oral reading tests. The new Gilmore Oral Reading Test accuracy scores were 16.6 for Programmed Reading and 17.7 for the Sheldon readers. On the Gilmore Oral rate score the Programmed Reading students scored 46.8 and the Sheldon readers scored 51.8. Even though the differences seemed to favor the basal readers, there is a lack of statistical significance in the difference. There is also probably a lack of educational significance in the difference.

The subsample was also given a list of high frequency words prepared by Arthur Gates and the Programmed Reading children scored 11.8 while the basal reading taught children scored 10.8 -- again, a non-significant difference. A statistically significant difference was found on a list of phonetically regular words which were read orally with the programmed reading children scoring 9.1 and the basal reading children scoring 5.4.

In summary, there does not seem to be much difference in the reading achievement of the students taught by Programmed Reading and students taught by the Sheldon basic readers. The Buchanan Programmed Reading series does emphasize the phonetic regularity of words and uses a kind of a phonics, or if you prefer, linguistics approach, and this does seem to give the students some advantage in terms of reading phonetically regular words only, but this advantage does not show up on more important segments of reading tests such as comprehension of paragraphs read silently or in the accuracy and speed of oral reading.

(Insert Table 1 about here)

Harry Silberman did a rather extensive review of the research and related theoretical articles entitled "Reading and Related Verbal Learning" that appeared in the book Teaching Machines and

Programmed Learning II published by the NEA in 1965. (25)
As part of this article he describes only one program evaluation of beginning reading that has any type of test results. This again is a description of the Buchanan beginning reading materials which were used at Crittenden School in Mountainview, California. A remedial class of 15, first through fourth grade children, used the program for 25 minutes a day, five days a week for three weeks. They showed a mean gain on the Gates Reading Test of four months. Since this report has no other citation, presumably, it was submitted to Silberman directly by the publisher or the author of the materials. This type of report is probably loaded with most of the errors that you could find in any kind of educational research. First of all, it is unsigned and it was presumably done by the materials seller. Secondly, it has only 15 students in it which is too small to give much reliability. Third, there was no control group. Next, it only lasted for three weeks which is certainly not enough time to use a standardized reading test and measure any gain at all (the standard error of measurement on most achievement tests for groups this size would be over three months). I do not deny that the Buchanan materials can teach reading. What I am saying is that little studies like this don't prove much. However, when you can get no other data, I guess you have to use what is available.

Talking Typewriter

An interesting demonstration type project has been carried out by O.K. Moore with his "talking typewriter." (25) In case you are not familiar with this device, it is a special typewriter attached to something like a small computer. When the student presses a key, the machine says the name of the letter. It can also be programmed so that if the student types a word, the machine says the word. Moore likes the term "responsive environment" in that the student is allowed to come in and simply hit keys at random listening to the letters. The environment, namely, the talking typewriter, responds to the child's inquisitive little fingers and this, according to Moore, is the best learning situation. The ideal free choice mode, however, is shortly terminated as soon as the machine tells him or shows him on a visual display a certain letter to hit and he learns to hit the correct key because all others will be silent and inoperative. In this manner, the child is then taught to copy words and eventually sentences.

I have visited Moore's laboratory in Connecticut and seen that children working with typewriters can, indeed, learn to read. However, the little boy they gave me to test who is about

four and reading on the third grade level also had an IQ of about 150. I would hesitate to generalize on a sample of one, but I must, in all honesty, say that I have never seen any studies reported by Moore which included IQ tests. Certainly, the next time I saw the talking typewriter was in a Harlem kindergarten situation and after several weeks of instruction, the children had only mastered three letters of the alphabet in a phonetic-type reading lesson. The Harlem experiences carried on by Lessar Gotkin are certainly a far cry from the type of children that Moore likes to show off on television and in his films.

Gotkin did publish a smidgen of data to the effect that eight children who were exposed to nine lessons ranging in length from about 40 to 125 responses showed gains on a letter naming pretest of the nine letters taught from 2.75% to 45.50%. Hence, there is some evidence that disadvantaged kindergarteners can learn slightly less than half of nine letters taught in nine lessons. (10)

Other Programmed Studies

Along this same vein, in the demonstration-type approach to teaching beginning reading, James Evans has reported that he

taught one 3½ year old how to read 218 short phonetic words using a Multi-Max teaching machine. (5) Evans aided in the development of the program called "Reading, a Programmed Primer," published by Grolier.(21)

Not all investigators of beginning reading using programmed instruction believe in phonics. McNeil and Keislar used essentially a whole word approach on a teaching machine in which 40 everyday words were taught to 182 non-reading kindergarteners. (18) The study was really an attempt to see if oral responses aided the learning of the words and their investigation concluded that it was. The authors also suggested that oral responding aided the motivation of children of IQ's below 100.

A teaching machine was also used by Falconer who conducted a study using 8 deaf children who were about 6 and 7 years of age. Using the machine for about five minutes daily for about two weeks they learned fifteen nouns. (8)

Robinson, Weintraub and Smith in their monumental collection of research findings in reading published annually in the Reading Research Quarterly report only two studies using programmed instruction in the past two years. (22) (23) In the first

study, Blackman and Capobianco taught reading to 19 mentally retarded youngsters using a teaching machine. (2) They did not learn to read any better than 17 equated students in the control group who used traditional special class procedures. The second study was the Ruddell study.

Programmed Teachers

The studies we have reported thus far use material that is programmed; that is, the student interacts with the material either in book form or on a machine with the teacher acting only as an overseer or, at best, a supplement to the instruction. However, Ellson, Barber, Engel, and Kampwerth attempted to program the whole tutoring situation including the untrained teacher. (4) In a little series of experiments and demonstrations, some 400 children were taught to read. These children included groups of slow learners, retarded children, as well as normal kindergarten and first grade readers. They report only one "failure." Gains tend to be reported in cumulative curves after the fashion of Skinner and his pecking pigeons. The authors felt that their programmed tutoring was most successful when it was used as a supplement to regular classroom teaching.

Perhaps at least a brief description of one of Ellson's experiment will give an idea of a type of programmed tutoring. The

tutor sits behind a wooden screen and holds up a word in a window. If the child calls off the word correctly, a light is flashed - meaning correct, and the tutor shows the next word. If, however, the child does not know the word, the tutor places a picture of the word alongside of it. If the student can now name the word with the help of the picture, the tutor removes the picture and sees if the student can say the word without having the picture present. If the student cannot say the word, the tutor helps him to say the word correctly, then a new word is shown.

A similar type procedure of human operated teaching machine has also been used by Statts. (26) Only, instead of rewarding the student with a flashing light, he is somewhat more lavish with his reinforcement budget and hands out tokens which are exchangeable for toys.

Computer Assisted Instruction

From a programmed tutor to completely automating the processes is but a short technological step. Today, the letters CAI standing for Computer Assisted Instruction are becoming almost as well known as various other trigrams such as IRA, ITA, and SCB.

The idea of putting tutoring, or at least the function of a teaching machine, into a computer has been with us since at least 1959 when Rath, Anderson, and Brainerd used a typewriter input-output station in the manner of a more or less traditional teaching machine. (20) Hence, we can say that at its simplest, computer assisted instruction for an individual needs simply a typewriter connected to a computer. Of course, the type of decision making process inside the computer can become extremely complex. The simplest type of procedure would be simply to ask the student to respond to a question or picture by typing in a word and the computer tells him whether or not he had responded correctly. A slightly more complex bit of programming would not only tell him if he was correct, but if he was wrong -- what the correct answer was. The next degree of complexity would be try to understand his wrong response, and if it was egregious enough to refer the student back for review or remedial work. Recently, much more complex decision making process, on the part of the computer, has been theorized and at least partially programmed by such workers as Stolurow, Lewis and Pask, Glaser, Atkinson and Hansen, and Simon and Kotovsky. (11) Atkinson and Hansen are interested in developing quantitative learning models that can be used to develop optimal instructional sequences and thus, maximize learning.

Duncan Hansen in his article, "Computer Assistance with the Educational Process" in the December 1966 Review of Educational Research lists about a dozen universities that have active and ongoing CAI projects. (11) There are at least three CAI projects that have beginning reading as one of their major emphases; these are the projects at Stanford with Suppes and Atkinson, the project at the University of Pittsburgh, directed by Robert Glaser, and the project at Harvard, directed by Larry Stolurow.

Most of the CAI projects related to reading have a good deal more input and output equipment than just a typewriter; for example, the Stanford project has for each of sixteen student's booths, a picture projector, a cathode ray tube, which functions much like a television tube, a light pen, a typewriter keyboard, set of earphones and a microphone. It is interesting to note that even the "boob tube" has been educated so that now it can accept feedback from the student. For example, the computer can display three words on the tube and ask the student to underline the correct word which would answer a question given aurally. The student takes his light pen and underlines the word; then the computer tells him whether or not his response was correct.

I have not seen any results that say whether or not a computer can teach reading better than a teacher in a tutoring situation or in a whole class situation. I have, however, seen plenty of reports about the expense of running a computer for instruction. Machine rental for just the equipment is very expensive and only feasible for research purposes. There is always the possibility, of course, that computers will become much cheaper, and with time sharing which allows a number of students' to work off one computer, plus the economical connections that can be made between a classroom and a central computer using just telephone lines, it is not inconceivable that classrooms or at least remedial reading rooms will have some CAI in the not too distant future.

In the development of curriculum material, Glaser and his colleagues at Pittsburgh are developing a system which is known as IPI which stands for Individually Prescribed Instruction. They have broken reading down into a number of skill oriented tasks by an educational type of job analysis, and have used a large number of materials such as a number of parts of the Sullivan Programmed Reading. At present, IPI is more of a "Systems Approach" which uses flow charts and a number of individually

assigned tasks to progress children through the reading curriculum. Once worked out, it is possible that a good bit of both the decision making for the "next step" as well as the actual curriculum materials such as the reading paragraphs and phonics sounds and symbols can be placed in the computer memory system.

Atkinson and Hansen have also published an article in the recent Reading Research Quarterly describing their CAI project in initial reading and given samples of computer and student behavior. (1)

Programmed Materials

The publishing industry seems to have taken some formal notice of programmed instructional materials in reading. The 1967 edition of Textbooks in Print has a section under Reading entitled "Programmed Learning." (29) It lists nine different sets of materials. However, the bulk of the programmed reading materials mentioned seem to be either the programmed reading materials prepared by Sullivan associates or the Lessons for Self-Instruction in the Basic Skills published by California Test Bureau. (See Figure 1)

Figure 1 listing the reading programmed instruction materials in Textbooks in Print is probably not completely thorough or up-to-date, but is a kind of objective measure of progress in the field. Earlier compilation of programs in all fields have been done by the Center for Programmed Instruction that is now merged with Teachers College at Columbia University and by Carl Hendershot. (12)

Not all programmed instruction is at one extreme or the other; that is, it doesn't have to have a computer and it doesn't have to be just a book. Some interesting materials are being developed that use sight and sound or just sound. For example, Imperial Productions. has developed a set of 40 tapes which teach reading skills ranging from reading readiness up to 3rd grade. (19) Each tape has an accompanying four-page worksheet. The reading readiness tapes tell stories and ask students to do tasks similar to that found in traditional reading readiness workbooks. The only difference, however, is that no teacher is needed; the tape guides as many children through as are plugged into the listening post. In older students, for example, the stories are read by the student and then comprehension questions are asked

orally, with the student writing the answers on his worksheet. After time has been allowed for the student to write his answer the tape tells him the correctness of his response. Needless to say, with only 40 short tapes to cover four years of reading instruction, this is intended as a supplementary program; but it does give some interesting thoughts to any teacher with a tape recorder who wishes to either purchase a prepared program or develop her own in conjunction with a set of printed materials.

A slightly more elaborate system is the Aud-X device developed by EDL which displays words as well as reads them to the child. An interesting modification of the Cloze technique that the Aud-X system uses is to tell the students a story orally, then the voice leaves out a word and the word is presented visually by the machine. Thus, the student is given semantic clues to help him to read the symbol. The Aud-X has also a set of workbooks which can be used in conjunction with the machine so that the student is interacting by following directions given by the machine, such as circling a yes or no or writing a word in a space. After allowing for the student to respond in his workbook, the machine can then tell the student the word and show him the correct word on its screen.

Attitudes Towards Programmed Instruction

Teachers seem to be leary of machines and automation; if not, new devices in toto. Table 2 which shows the results of a study done by Tobias on teachers' attitudes toward programmed instructional terms found that such terms as "teaching machine" and "automated instruction" were the most disliked by teachers. (30) Slightly less threatening were such terms as "programmed text" and "programmed instruction." But the teachers really felt more at home with terms like "flash card," and "workbook." Though this study was not done on reading teachers per se, presumably it applies to them equally.

(Insert Table 2 about here)

There have been numerous studies done on students' attitudes toward programmed instruction, though none specifically in the field of reading. A typical finding would be the one by McGuigan and Peters which surveyed some 400 elementary and secondary students and found that 55 per cent of their responses were favorable towards programmed instruction, 26 per cent were neutral, and 19 per cent had negative reactions. (15)

While the attitudes of teachers and pupils are important, there are forces outside the school which may be of great importance in the next few years. I would like to quote directly from a report entitled "Automation and Technology in Education" prepared after hearings by the Joint Economic Committee of the Congress of the United States:

> "Educational technology is now a major field of corporate research and investment. It is not only the business equipment manufacturers who are involved, but a great variety of corporations, many of them among the giants, ranging from steel and chemicals to publishing firms, who are directing their efforts more to the burgeoning education market. One witness stated:
>
> ' The American economy was built around the railroads in the last half of the 19th century, around the automobile in the first two-thirds of this century, and it will be built around education in the balance of this century.'" (27)

This statement may seem a little strong, but one doesn't need to walk much further than the convention floor or to read much more technical material than the financial pages of the newspaper to know that there is at least some truth in it and reading teachers had best be aware of this trend.

Conclusions

There seems to be plenty of evidence that programmed instruction and its technological neighbors of computer assisted instruction and talking typewriters can teach beginning reading. There is no proof, however, that it can teach beginning reading any better than regular classroom teaching or human tutoring. In fact, in the only well controlled study we were able to find (Ruddell) programmed learning and basal texts came out in a dead heat. Thus, the classroom teacher should feel free to use as much programmed instruction or automated procedures as her temperament and budget will allow.

BIBLIOGRAPHY

1. Atkinson, Richard C., and Hansen, Duncan N. "Computer-Assisted Instruction in Initial Reading: The Stanford Project," Reading Research Quarterly, Vol. 2 (Fall, 1966).

2. Blackman, L. S., and Capobianco, R. J. "An Evaluation of Programmed Instruction with the Mentally Retarded Utilizing Teaching Machines," American Journal of Mental Deficiency, 70, (1965).

3. Bundy, Robert F. "Computer-Assisted Instruction: Now and for the Future," Audiovisual Instruction, Vol. 12, No. 4 (April, 1967).

4. Ellson, D. G., Barber, Larry, and Engle, T. L., and Kampwerth, Leonard. "Programed Tutoring: A Teaching Aid and a Research Tool," Reading Research Quarterly, Vol. 1 (Fall 1965).

5. Evans, James L. "Teaching Reading by Machine: A Case History in Early Reading Behavior," AV Communication Review, Vol. 13 (Fall, 1965).

6. Falconer, George A. "A Mechanical Device for Teaching Sight Vocabulary to Young Deaf Children," American Annals of the Deaf, Vol. 106 (March, 1961).

7. Fry, Edward B. Teaching Machines and Programmed Instruction: An Introduction. New York: McGraw-Hill Book Company, Inc., 1963.

8. Fry, Edward B. "The Use of Programmed Learning in the Teaching of Reading," Reading as an Intellectual Activity. International Reading Association Conference Proceedings (J. Allen Figurel, Ed.) Vol. 8, 1963.

9. Gentile, Ronald J. "The First Generation of Computer-Assisted Instructional Systems: An Evaluative Review," AV Communication Review. Washington, D.C.: Department of Audiovisual Instruction of the National Education Association, Vol. 15, No. 1 (Spring, 1967).

10. Gotkin, Lessar G., McSweeney, Joe, and Richardson, Alice. Acquisition of Pre-Reading Skills in Five Year Old Children From Disadvantaged Backgrounds Using the E.R.E. Automated Teaching System," National Society for Programmed Instruction Journal, Vol. 4, No. 3,(March 1967)

11. Hansen, Duncan N. "Computer Assistance with the Educational Process," Review of Educational Research, 36., No. 5 (December, 1966).

12. Hendershot, Carl. Programed Learning: A Bibliography of Programmed and Presentation Devices,(3rd Edition) University Center, Michigan: Published by the author, 1964.

13. Lang, Phil C. Programmed Instruction. Sixty-Sixth Yearbook for the Society for the Study of Education, Part II. Chicago, 1967.

14. Loretan, Joseph O. "Programmed Instruction in Reading," High Points, Vol. 45 (December, 1963).

15. McGuigan, F. V. and Peters, Robert J., Jr. "Assessing the Effectiveness of Programed Texts--Methodology and Some Findings," Journal of Programed Instruction, Vol. 3, Nos. 1 and 2 (1965).

16. McNeil, John D. "Programed Instruction as a Research Tool in Reading: An Annotated Case, The Journal of Programed Instruction, Vol. 1, No. 1 (1962).

17. McNeil, John D. and Keislar, Evan R. "Individual Differences and Effectiveness of Auto-Instruction at the Primary Grade Level," California Journal of Educational Research, Vol. 12 (December, 1961).

18. McNeil, John D., and Keislar, Evan R. "Value of the Oral Response in Beginning Reading: An Experimental Study Using Programmed Instruction," British Journal of Educational Psychology, Vol. 33 (June, 1963).

19. Primary Reading Program. Kankakee, Illinois: Imperial Productions, Inc.

20. Rath, Gustave J., Anderson, Nancy S., and Brainerd, R. C. "The I.B.M. Research Center Teaching Machine Project," In Automated Teaching: The State of the Art. Edited by Eugene Galanter, New York: Wiley & Sons, 1959.

21. Reading: A Programmed Primer, TMI-Grolier Self-Tutoring Program. Distributed by Teaching Materials Corporation, a division of Grolier, Inc. New York: circa 1964.

22. Robinson, Helen M., Weintraub, Samuel, and Smith, Helen K. "Summary of Investigations Related to Reading, July 1, 1965 to June 30, 1966," Reading Research Quarterly, Vol. 2, No. 2 (Winter, 1966)

23. Robinson, Helen M., Weintraub, Samuel, and Smith, Helen K. "Summary of Investigations Related to Reading, July 1, 1964 to June 30, 1965," Reading Research Quarterly, Vol. 1, No. 2 (Winter, 1965).

24. Ruddell, Robert B. "The Effect of Four Programs of Reading Instruction with Varying Emphasis of the Regularity of Grapheme-Phoneme Correspondences and the Relation of the Language Structure to the Meaning on Adjustment on First Grade Reading," Report of Research Project #2699. Berkeley: University of California, 1965.

25. Silberman, Harry F. "Reading and Related Verbal Learning," Teaching Machines and Programed Learning, Vol. 2 Washington, D. C.: National Education Association, 1965.

26. Staats, A. W., and Staats, C. K. Complex Human Behavior (2nd Edition) New York: Holt, Rinehart, and Winston, 1966.

27. Sub-Committee on the Economic Progress of the Joint Economic Committee, Congress of the United States, Wright Patman, Chairman (A Report) Automation and Technology in Education Washington, D.C.: Government Printing Office, August, 1966.

28. Suppes, Patrick. "Modern Learning Theory and the Elementary School Curriculum," American Education Research Journal, Vol. 1, No. 2 (March, 1964).

29. Textbooks in Print - 1967. Including Related Teaching Materials. New York: R. R. Bowker and Co., 1967.

30. Tobias, Sigmund. "Teachers' Attitudes Toward Programed Instructional Terms," Journal of Programed Instruction, Vol. 2, No. 3 (1963).

cational

31. Trow, William Clark. "Letters to the Editor," Ed
Psychologist, Vol. 4, No. 2 (March, 1967).

TABLE 1

PROGRAMMED READING COMPARED WITH BASAL READERS AT THE END OF 1st GRADE

(Data taken from Ruddell 1965)

Group Reading Test Means	Buchanan Programmed Reading	Sheldon Basic Readers
Stanford Achievement Test Primary I (N=about 132 per cell) Grade Scores		
Paragraph Meaning	1.6	1.7
Word Reading	1.8	1.7*
Word Study Skills	1.7	1.7
Spelling	1.7	1.7
Individual Reading Test Means		
Raw Scores (N=about 44 per cell)		
Gilmore Oral Accuracy	16.6	17.7
Gilmore Oral Rate	46.8	51.8
Gates Word - Oral (Words not selected for phonic regularity)	11.8	10.8
Phonetically Regular Words Oral Reading Test	9.1	5.4*

*Ruddell found raw scores with statistically significant differences between means at .05 level.

TABLE 2

ATTITUDE OF 50 TEACHERS TOWARD PROGRAMED INSTRUCTION

(Tobias 1963)

Terms	Mean Rating
Teaching Machine	26.09
Automated Instruction	23.80
Mechanized Tutor	22.16
Technological Terms	24.13
Programed Text	30.31
Tutor Text	28.65
Programed Instruction	31.73
Programing Terms	29.94
Flash card	31.77
Exercise Book	33.33
Workbook	33.78
Traditional Terms	32.97

(Maximum score 42)

FIGURE 1

READING PROGRAMMED INSTRUCTIONAL MATERIALS LISTED IN

TEXTBOOKS IN PRINT

1-2)

Allen, R. V. & Claryce. Language Experiences in Reading (Gr
Encyclopedia Britannica Press.

ction

Bostwick, Gracecarol.and Miles Midloch. Lessons in Self-In
in the Basic Skills (Various titles Grades 3 to High School
California Test Bureau.

Carroll, Lucy. Programmed Phonics (2 books) Educational
Publications.

Loesel, W. G. Help Yourself to Read,Right, and Spell (2 bo
Educational Development Corporation. Ginn

Glassman, J. Programmed Reading. Globe

Loretan, Joseph O. and New York City Schools staff. Buildi
Reading Power (kit) Merrill.

Sullivan Associates. Programmed Reading (Grades 1-3) Webst
McGraw-Hill.